# FLIGHT OF STS–8 WITH ASTRONAUTS CAPT. RICHARD H. TRULY, COMDR. DANIEL C. BRANDENSTEIN, LT. COMDR. DALE A. GARDNER, LT. COL. GUION S. BLUFORD, JR., AND WILLIAM EDGAR THORNTON, M.D.

# HEARING

BEFORE THE

# COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

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# FLIGHT OF STS-8 WITH ASTRONAUTS CAPT. RICHARD H. TRULY, COMDR. DANIEL C. BRANDENSTEIN, LT. COL. GUION S. BLUFORD, JR., LT. COMDR. DALE A. GARDNER, AND WILLIAM E. THORNTON, M.D.

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TUESDAY, SEPTEMBER 27, 1983

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
*Washington, D.C.*

The committee met, pursuant to call, at 10:30 a.m., in room 2318, Rayburn House Office Building, Hon. Don Fuqua (chairman of the committee) presiding.

Mr. FUQUA. The committee will be in order.

Without objection, cameras and television equipment will be allowed during the proceedings.

The committee is pleased to welcome the crew of the eighth flight of the space shuttle and the third flight of the orbiter *Challenger,* Comdr. Richard Truly, Comdr. Dan Brandenstein, mission specialists Dale Gardner and Guy Bluford, and Dr. William Thornton.

We're all happy to have you, and your mission was another first in a highly successful space shuttle program, as it achieved the first night launch and landing, as well as testing the qualities of the remote manipulator system by handling the largest payload to date.

Your mission has also been described as the most perfectly flown mission to date, and you can take great pride in that accomplishment.

It should be noted that this is the second mission aboard the shuttle orbiter for Commander Truly, and I wish to congratulate you on this accomplishment, as well as your appointment as the Navy's head of the newly formed Space Command, effective October 3 of this year, hopefully.

I also want to thank the crew for being here today. I realize that there's another very important program going on in Los Angeles, a salute to the air and space bicentennial celebration, and I know that they very much wanted you to be at that function. We appreciate you being here. And I know you are being represented by Bob Crippen, I understand, at the event in Los Angeles.

It's a pleasure to welcome you, all of you, and to congratulate you on a very successful mission. We look forward to your report

on the flight, and take great pride in adding your names to the list of successful crews of the previous seven flights.

Certainly I'd be remiss if I didn't acknowledge the support and courage contributed by some very fine people who are sitting behind you, and never get the limelight, but Cody Truly, Jane Brandenstein, Linda Bluford, and Elizabeth Thornton. For you, we thank you very much. [Applause.]

We're sorry that Sue Gardner could not be here, but with young ones, it prevented her from joining.

At this time, I'd like to recognize the ranking minority member of the committee, Congressman Larry Winn from Kansas, for any remarks that he may wish to make.

Mr. WINN. Thank you, Mr. Chairman.

I do want to salute and congratulate the crew of the STS–8. I was not able to get there for the launch or the landing, which is most unusual for me, but I do want to congratulate you. And I'll tell you, you guys put on a great show via television, because I watched it on television. I'm not sure about the hours you keep, it makes it a little tough for a fellow trying to enjoy the normal life to keep up with your hours on launch and landing.

But I do want to congratulate you again for an outstanding performance. We're very, very proud of you.

Let me say that, just this last weekend, I met with the delegation from the European Parliament representing 10 European community countries, and I gave a space report on—on Sky Lab I upcoming which, as you know, is a joint effort with the Europeans. And they were pleased that I pointed this out in the public hearings with them, but at the same time, several of them were still asking me questions about your flight. Mainly they were interested in the space sickness, and I talked to Dr. Thornton about that last night. They were interested in some other things because, as you well know, they have a German physicist from Holland who will be aboard that flight.

So my point is that there is certainly still a lot of interest around the world, and the fact that we are now going to take some Europeans up with us as part of the—the crew, I think, adds a great dimension to the success that we've had in the United States.

Thank you, Mr. Chairman.

Mr. FUQUA. Thank you, Mr. Winn.

Mr. Volkmer?

Mr. VOLKMER. Thank you, Mr. Chairman. I, too, wish to add my congratulations to the crew of STS–8, and look forward to hearing their statement as to the flight, and ask some questions later on. But I would like to congratulate them and say that I'm sure still it's not uneventful, that it's quite an event to travel into space.

Thank you very much.

Mr. FUQUA. Thank you.

Richard, we are now pleased to hear from you, and congratulate you and the crew once again for a very excellent job. You sure almost made my birthday a very eventful event, but for 10 days late, it wasn't bad at all.

Mr. WALKER. A big Roman candle.

**STATEMENTS OF CAPT. RICHARD H. TRULY, U.S. NAVY, COMMANDER, STS-8; COMDR. DANIEL C. BRANDENSTEIN, U.S. NAVY, PILOT, STS-8; LT. COMDR. DALE A. GARDNER, U.S. NAVY, MISSION SPECIALIST, STS-8; LT. COL. GUION S. BLUFORD, JR., U.S. AIR FORCE, MISSION SPECIALIST, STS-8; AND WILLIAM EDGAR THORNTON, M.D., MISSION SPECIALIST, STS-8**

Captain TRULY. Thank you, Mr. Chairman and members of the committee, and thank you for the opportunity for us to be here today.

We're reporting on a space shuttle flight that went as smoothly as ours did primarily due to the *Challenger,* which has only flown three flights, but had virtually no failures on orbit. It is a pleasure for us to be here, and we'd like to spend a few minutes sharing it with you, if we may.

I guess I would like to first summarize the flight by saying that, in my view, the most important thing that the space transportation did on this flight was meet our customer commitment to the Indians. We deployed the Indian national satellite on this flight. It was checked out on orbit by Guy Bluford, who is a mission specialist and who was primarily responsible for that, assisted by Dale. It was checked out, it was healthy, we deployed in attitude at the right spot and on time.

As you know, after flight 6 and the problems that we had on the IUS on that flight, on flight 8 we had to change the manifest at a fairly late date. We pulled—we kept the Indian national satellite on the flight. We pulled up from a later flight the payload flight test article, the PFTA, which, as you mentioned earlier, was the heaviest article that we have now tested with the Canadian-built remote manipulator system. That was done primarily by mission specialist Dale Gardner. I was his trusty aide on the TV cameras and the checklist on that.

The—we flew—we reflew the continuous-flow electrophoresis system that, as you know, is a joint venture by McDonnell-Douglas and Johnson & Johnson, and in conjunction with an agreement with NASA, and we flew for the first time live-cell samples to be processed through the cephus, and that was successful.

Finally, I would say that another thing that we're very proud of is because of the geometry, the worldwide geometry requirements of the Indian national satellite. As you know, we were launched at about 2 a.m. eastern daylight time, and that required us to make a night landing. So, for the last year, Dan Brandenstein and I have been doing a lot of flight tests and development of a night lighting system, a new heads-up display in the orbiter. And we can report and show you some—some photography of that shortly, but I think it is an understatement that the work that was done by many people on the night lighting area was immensely successful. And, I think, it opens up future ease in flight planning for shuttle missions. We don't think it's that big of a deal.

Finally, I'd like to say that, fairly late in our training process, we had the delight of having Dr. Bill Thornton added to our crew to make some measurements as people adapt to zero gravity, so that we can attempt to really get at this business which has become known as the space adaptation syndrome. The other four of us

were quite willing persons to be measured by Bill. He didn't do anything to us that hurt. And we think, frankly, that when he has had the time to develop the data, that we will be a long way toward, not just putting up with, but solving that particular problem.

Finally, there was a lot of fireworks on the flight, launching at 2 a.m. We wondered before the flight whether or not we would see much light in front of the cockpit during the launch. That was the silliest thing that we worried about during the whole training period. It was bright as day during the first stage, and, again, I think, you'll see some of that.

So, with your permission, sir, what we'd like to do is show you a short movie that summarizes the flight, and each of us will try to participate in narrating it for you, and then at that point, we have a few slides of the Earth that we took as we circled the globe. Because of the night lighting situation on this flight, we were the first crew to have a daylight mission—it was our daylight really—over the southern hemisphere. And so we have some photography of Australia, South America, Africa, and some of the South Pacific islands that I think that you can't help but enjoy a little bit.

So, with your permission, sir, we'd like to show the movie.

[Film shown.]

Commander BRANDENSTEIN. This is the insignia depicting the first night launch that we chose for our flight. The most difficult part of the flight was agreeing on the insignia.

Here we go out to man the vehicle. There was a tremendous thunderstorm going on, it was raining. It was not depicted in this movie, but I think, to a man on the crew, we were reasonably sure we weren't going to launch that night. However, the weather cleared and we were able to go 17 minutes late.

We are getting ready to—just prior to main engine ignition. The three main engines started up and performed beautifully the whole ascent.

Here's a picture of the cockpit. You can see a little bit of the vibration. That's Captain Truly.

There the SRB's go, and we're off. That's the light we saw. It was—the whole first stage was similar to being inside of a big glowing ball of fire. We had a lot of reflection back in the cockpit. None of it was such that we had difficulty reading the instruments, nor was the vibration giving us any problem reading the instruments. But it was—we didn't have to worry about adjusting the lights in the cockpit, because you could see quite well just from the glow from the solid rocket boosters.

Due to the extensive debriefs we've had on the seven previous missions, I think all of us were well prepared for what to expect during the ascent, with the exception of how much light we were going to get back in, and we had discussed that some. And there were no real surprises.

Once again, the cockpit—if you look in the windows, you can see that that's essentially what it looked like outside. In a second, you'll see us going through the cloud layer and there will be a lot more light reflected back in the cockpit. Right there, that's the light due to the—going through the clouds being reflected in from the solid rocket boosters.

There'll be a clip coming up shortly. We'll go back outside, and then we'll get another one inside that shows that when the solid rocket boosters separate, you have separation rockets that push it away from the vehicle, and that was a very bright flash. After that, the second stage was a very smooth ride all the way up into orbit. Right there is the separation of the solid rocket boosters. Now we're just going on the main engines for the rest of the way.

Colonel BLUFORD. This is an example of just some of the view that we saw on orbit. It was really quite a spectacular view.

One of our primary missions on this particular mission was to—one of our primary functions on this particular mission was to deploy the Indian satellite, and this is how we were set up to deploy it. Dick over here on the left sort of supervised the operation. Dale handled switches and cameras along with Dick. And I worked from the front cockpit out of the commander's seat. You can see me coming into view, handling a lot of the data and command information to and from the satellite.

This view of the cockpit was taken by Dan Brandenstein, who is flying the vehicle from the pilot seat, and we were using a see-through sort of 16-millimeter camera, which we were checking out for the first time.

Normally, in operating—deploying the satellite, we require four crew members. Here's a picture of the satellite actually deploying. It deployed very smoothly. You can see that it was a very smooth rotation, no procession of the satellite as it left the cargo bay. There was a distinct thump when the satellite was released, but you can see here that it smoothly left the cargo bay and deployed very evenly. About a minute and 20 seconds after deploy, Dale Gardner indicated that he could see some of the small rocket thrusters on the satellite during the mutation phase, so that we could tell that the satellite was really working properly.

Another aspect of our mission was to check out the TDRSS satellite. One of the important aspects for this next mission, STS-9, is the operation of the satellite, and so here we are with the KU—band checking out the communication lines up and down between Houston and the satellite and the shuttle to verify that all those lines are good, so that when we fly the spacelab, in which we need that satellite, we'll be able to do that very comfortably.

Commander GARDNER. OK, another of our jobs during the mission was to perform the final tests and evaluation of the remote manipulator system, that's the arm built by the Canadians. You can see it here in this view in its normal rest position along the side of the vehicle. It's held there by pylons, one of which you can see at the bottom of the screen. And right as we're ready to use it, we release it from those pylons, and the arm, as you all know, has three joints, much as your own arm—shoulder, elbow, and wrist—and by manipulating those joints, either singly or with computer aid, we can do the job at hand.

Here you can see I'm flying the arm in to grab hold of the PFTA, that large weight that Richard talked about a second ago. The—we had a couple tasks to do with it. One was to put the arm with the weight on it in different configurations, and then move the orbiter or the weight to test the dynamics, which then could be fed back

into computer models so we can predict what even heavier payloads will do in the future.

And the second task was to put the arm in its most degraded mode, similar to where you just move one joint at a time and try to unberth the payload out of the payload bay or—and to put it back into the payload bay in that very degraded mode.

All those tests went superbly. We had approximately 15 hours of RMS activity. We had no problems whatsoever with the arm. The Canadians, our friends of the north, can be very proud of that piece of equipment. It finished its tests and evaluation, and is ready to go on now into operational use onboard the shuttle. And coming up on Flight 13, you'll see that being put to good use as the RMS pulls in a deployed malfunctioning satellite for repair.

We did one more thing with the arm before we put it to bed finally a few days prior to entry, and that was to bend it underneath the vehicle to actually look at the bottom of the orbiter. We've had this on the—in our checklist since flight 2 when Richard flew, but have never used it. This is 16-millimeter movie film made of the TV, so it's not quite as clear as what we really saw. This is the bottom of the vehicle. You can see the individual tiles. The part you see sticking up there is one of the elevons, one of the elevators in the wing. It's actually floated down because the hydraulic system is turned off. And in the real TV, you can almost read the individual tile numbers on those 6-by-6-inch tiles. So we were really impressed at the view that we had at the bottom of the vehicle, if we ever needed to do such a survey.

This is at night. The flashes you see are the small rocket engines on the back of the vehicle firing to control our attitude. And the interesting thing here is what happens when the firings stop. You see—see the glow around the edges of the vehicle. It fades away here, but with our eyeballs that was present all the time; and, down at 120 miles altitude, it was very evident, where there's more oxygen atoms.

Here we're setting up in the middeck to show you one of the oms burns, a rocket engine burn on orbit, and you can see the effect it has on Bill Thornton and I on the middeck. The nose of the vehicle is to the left of the screen, so as we accelerated at approximately 1/16th of what the acceleration of earth is, you can see that everything wants to accelerate or float toward the—toward the back. Dan and Richard were up on the flight deck performing this maneuver, while Bill and Guy and I were down in the middeck to show you this scene. It felt like about half a G after being in orbit for a few days, but it was really only a sixteenth.

This is—you can see the electrophoresis device in the background, the tall blue mechanism. I've just separated some kidney cells, live, living human kidney cells that are in that tray in my hand. I've just shaken it up to make sure the cells have mixed properly with the nutrient materials which will keep them alive until we get them back on the ground. And now I'm putting the tray into a cooler, where it remained until we landed. All the cells separated properly.

Dr. THORNTON. This a shot of the treadmill to maintain condition to re-enter. And here is a rotator in which I'm investigating various functions of the equilibrium system of the body. My chief in-

terest here was the way the nervous system adapts to weightlessness and readapts on return to one G, and that was the intent of this, and a large number of other experiments.

We actually had the equivalent of a well-equipped laboratory. Here, looking at reaction response, tracing various series of movements. And this you may have seen before, once again, looking at the organs that sense gravity, sense accelerations inside the head. As Richard pointed out, all of these things are painless and noninvasive.

Captain TRULY. This is a view of me doing one of the tasks on orbit which is required to maintain the temperature of the vehicle. We're changing a cooling valve there. But one of the things that I like about this picture is that it's a good example of how easy it is to get around in zero gravity and—and just do a simple task. If we worked as hard on Earth as we did in the few days we were in orbit, we would have just been totally exhausted. But floating around up there is still just as much fun as it's always been, and I'm sure every report you get will include that.

This is Guy preparing a meal on orbit. All the food trays are up there on the lockers. And a major league baseball team, I'm sure, is going to sign him up for these catches he's making. Actually, Dale, I think, was out of the field of view to the left and was tossing over the—the entrees to prepare the meal. We took turns fixing meals. And, incidentally, I might comment that a crew of five always provides you with an extra hand so that you can always stay on the time-line and keep your buddies out of trouble and avoid getting behind and missing something important. This is Bill getting a waterpack, I think, and preparing to make the—his drink for the evening.

One of the things that we have to do also is to change the lithium hydroxide canisters which scrub the air of—and make it breathable. You'll notice we—one problem that we did have was the inhalation of some dust from these canisters. And you'll notice that Guy and I each have on a surgical mask to help solve that problem.

The—several of the passengers in the shuttle ride in these little seats. We take them down on orbit so that they will be out of the way and we can get around. And this is just a demonstration that, in less than 2 minutes, we can get the seat prepared. That's Dale's feet that you see. Guy and Bill are alining the little locknuts. And Dale just pushes down on it, erects the back, unlatches the seat belt, does a little zero-G turnaround, and he's latching himself in for entry.

Dale took—Dale, you might want to comment on these photos. These were photos of the entry glow that Dale took from a seat just behind Dan's pilot seat.

Commander GARDNER. This is about mach 23 out the forward windows, and you can see that we have an orange glow out—the view now.

This series of photos takes some explanation. Over my head, as I sat up in the flight deck, is a window. It's very much like the sun roof in your car. And I noticed, as I was taking those forward window shots, a flash on my shoulder that I didn't know where it was coming from. I looked through that overhead window. I

couldn't see what was happening back over the vehicle, but I took the movie camera and held it backwards and shot through that overhead window, and you can see the outline of the window in some of these frames. We have no idea at this point what this flashing phenomenon is that you see here. It's—it's—you can notice that it seems to move from the left side to the right side, starboard to port, at times. Every once and a while, there was a larger flash, much larger than some of the intermediate ones. And our thermal people are, even at this point, trying to understand this. We have always been in the daylight at this point before, we've never really seen this happen. And we always thought all the glow and all the fireworks was happening on the bottom of the vehicle, but obviously that's not the case. A little later on, this orange glow, down around mach 17 and 15, turned—turned white, and we can see glow on the windows. And, finally, around mach 8, the glow went away altogether.

Captain TRULY. All things—all good things must come to an end. This is an infrared TV view using an infrared scanner from China Lake. Notice how the nosecap of the orbiter is. We're now probably at about 1,000 feet above the lake bed surface. The time is about 20 minutes until 1 in the morning, Pacific daylight time. And the vehicle has done an automatic entry until it is subsonic, in which I took it and was flying it here.

There's the gear that came down. You can see the black cold tires. And I defy Hollywood to make a movie of a spaceship's return to Earth that is any more dramatic than this particular shot. The *Challenger* touched down to within about 300 feet of the landing spot and on air speed. It was an easy landing to make. The night lighting system provided Dan and me a view of the runway all the way through the derotation of the nose. And here during the breaking phase, the vehicle stopped—the total roll was about 9,300 feet. And, all in all, the year's worth of flight tests and night landing and night lighting development that so many people worked so hard at paid off.

Here we are. I'm holding on with dear life to the handrails so I don't fall down in front of the TV cameras because, frankly, adapting to 1 G is just as important as adapting to zero gravity. We were a little wobbly for 2 or 3 hours. But, all in all, in addition to everything else, you can see that we had a lot of fun at the flight.

[Applause.]

Captain TRULY. If we may now, what we would like to do is very briefly show you some photography that we took—took of the Earth. Again, we—we generally saw the southern hemisphere. As we crossed the equator southbound on our orbits, the Sun rose; and as we crossed it northbound, the Sun set.

SLIDE 1

Captain TRULY. This is snow-covered peaks in the Andes with a very pretty blue lake in the center [slide 1].

Next slide, please.

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SLIDE 2

Commander BRANDENSTEIN. This is a dust storm that we saw [slide 2]. It's on the border between Chile and Argentina. And the Pacific is at the top of the picture. We're looking west here. Dust is blowing across the highlands, and then it is blowing up over the clouds on the lowlands down in the lower left of the picture.

Next slide, please.

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SLIDE 3

Commander BRANDENSTEIN. OK. This is the area around—in South Africa around Johannesburg [slide 3]. There's several—there's a system of about four very large old meteorite impact craters there, and it is also a very rich ore area. Right in the center of the picture, you can see one, and then down to the lower right, you can see more or less the rim of another. These are, like I say, very old craters that have pretty smoothed down.

Next slide, please.

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SLIDE 4

Captain TRULY. This is in South Africa [slide 4]. You can see a large geological formation there in the center running from bottom to top, very visible from on orbit and extremely long. You can see, almost in the upper center of it, where, after it was formed, another fault shifted it—on this photograph, right to left—and you can see the break in that formation that occurred many millions of years after the original was—began to form.

Next slide, please.

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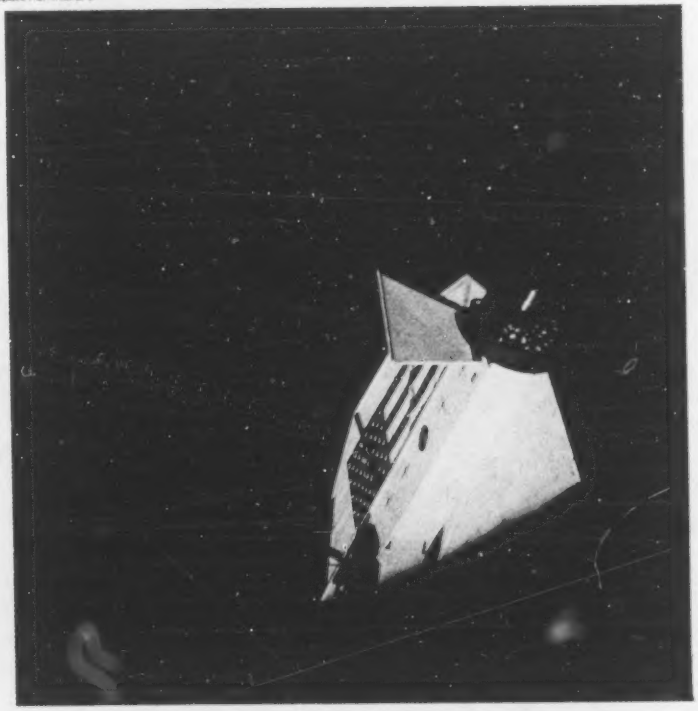

SLIDE 5

Captain TRULY. This is a—actually, it's an underwater—it's about 30 feet under the water. And it's a reef off the eastern shores of Australia [slide 5].

Next slide, please.

SLIDE 6

Captain TRULY. One of the things that we saw from the flight, and we reported vigily, was several volcanoes that were erupting, one of which was not known and was later confirmed. This is a—in the Indonesian Island chain [slide 6]. And there in the center, you can see an active volcano. If you look carefully at the other islands, there—there's probably eight or nine volcanoes in this photograph.

Next slide, please.

SLIDE 7

Commander BRANDENSTEIN. OK. This is another picture, or one of the pictures, of Australia [slide 7]. We got many pictures of Australia since it was light down there all the time, some which have never been gotten before.

This is another meteor impact crater right in the center of the picture, and it's somewhat younger than the ones around Johannesburg, and the edges are much more distinct. Also, there's some folded mountains up to the upper left and lower right, some unique geological formations. They're the Macdonnell Range in central Australia.

Next slide, please.

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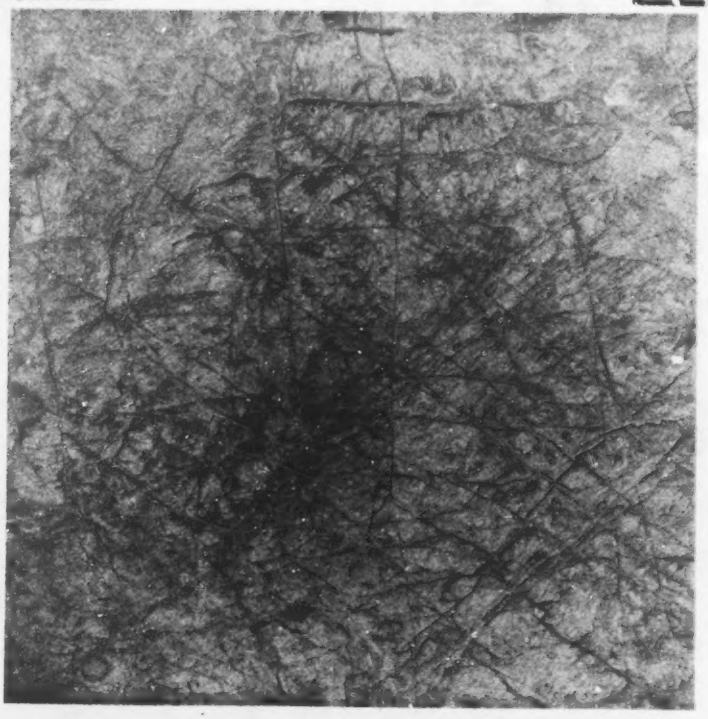
SLIDE 8

Captain TRULY. This is an interesting area of—in north central Australia [slide 8]. If you look very carefully—we have two photographs, I think, of this area. If you look carefully toward the bottom center, you will see it's almost like a giant kid took a stick and drew straight lines in the sand and then crossed them at 90 degrees, and then came back and crossed them again at 45 degrees. These are large linear faults. They do not show up because of the scale on the maps of this area. We went back and looked, and the patterns just don't show up because the—this area has been mapped from the surface and you can't see these large connections of fault lines.

Next slide, please.




SLIDE 9

Captain TRULY. This next view was taken with a longer—with a 250-millimeter lens on the camera, and again you can see these long, straight fault lines crisscrossed in three different directions [slide 9]. This is an extremely rich uranium ore area of Australia.

Next slide, please.

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SLIDE 10

Captain TRULY. This is an interesting view [slide 10]. It's an island, again out in the Indian Ocean, I believe. The—if you notice, it has cloud streaks. The wind is blowing from left to right. And you can see behind—in the wake of the island evidence in the clouds as to which way the wind is blowing, and if you look in the still water surface, you'll notice that the islands, since the current is also moving from left to right, you'll notice there's a wake behind the island even—as if it were a ship steaming the seas.

Next slide, please.

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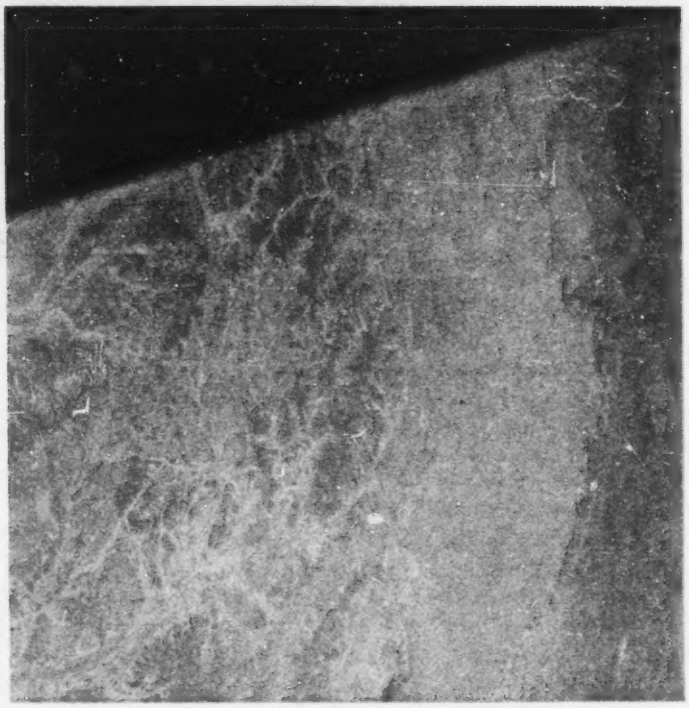

SLIDE 11

Captain TRULY. This is an interesting thing [slide 11]. We thought we—if you look right in the center, there is what appears to be a perfect circle formed by the exterior diameter of a large complex river basin and drainage area in Australia. As we looked at the surface map after the flight, we realized that, in fact, it is not a large circle, but from our view, we thought possibly it was a large uncharted impact crater. But it turned out that it was not.

Next slide, please.

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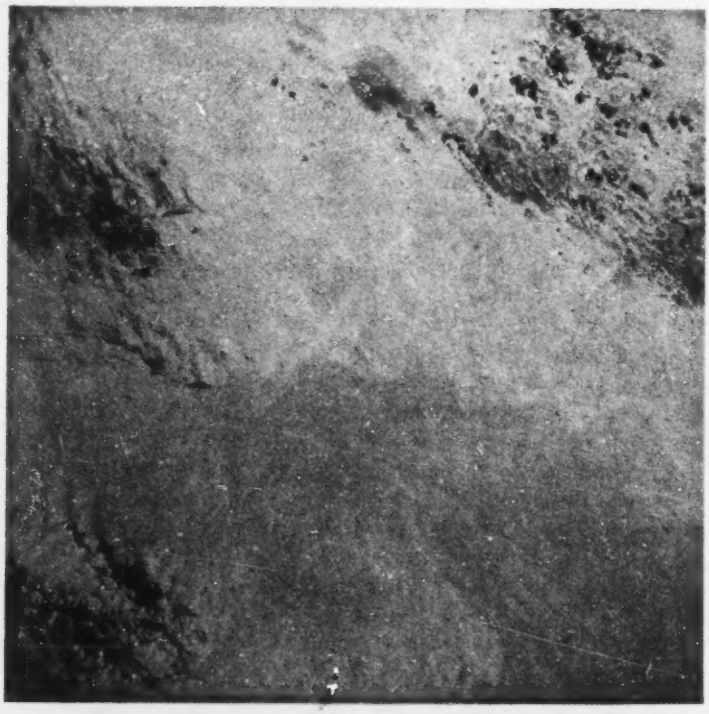

SLIDE 12

Commander BRANDENSTEIN. OK. Generally, we think of the ocean as not very dynamic, but with the proper sun angle, there are a great many currents and eddies in it [slide 12]. And this probably isn't our best picture of it, so we'll—next slide, please.

SLIDE 13

Commander BRANDENSTEIN. There's probably a better one [slide 13]. But to keep the oceanographers happy, we also had been briefed by them on what to look for, and here you can see a very dynamic part of the ocean with many eddies and swirls. And, as I said earlier, if the sun is at the right angle, it really gets very noticeable in a photograph.

Next slide, please.

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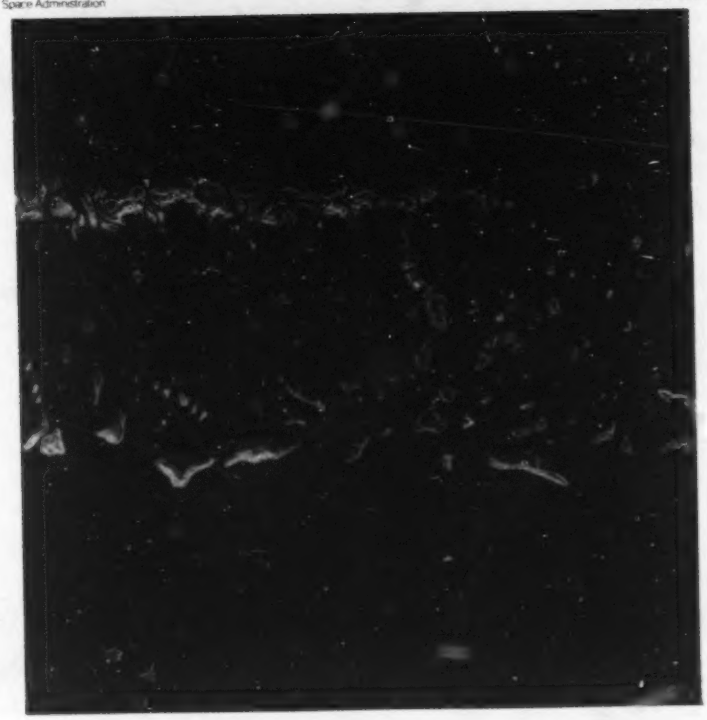

SLIDE 14

Commander BRANDENSTEIN. This is the Great Barrier Reef off of the eastern coast of Australia [slide 14]. And we had some pictures of this from end to end, and they are very beautiful in real life, and the camera and the film just don't quite do them justice.

Next slide, please.

SLIDE 15

Captain TRULY. This is some of the beautiful islands in the south seas [slide 15]. Right in the center there is the Island of Bora-Bora. This is in the Tahiti chain. But many days we would find ourselves leaving Australia and floating across the South Pacific, and the islands and atolls down there were just a beauty to behold.

Next, please.

I think that concludes the slides.

Mr. Chairman, Thank you very much for the opportunity for us to come to report to you on this flight. We feel very strongly that it was a very successful one. We certainly enjoyed participating in it.

I'd like to close on a final note that—that this crew that I was assigned to command on this flight did a surperb job. A couple of them have already been assigned to follow-on flights, and all of them, I'm sure, very soon will. They did a surperb job, and I would like to commend them to you. Thank you, sir, very much.

Mr. FUQUA. Thank you very much, Richard, and all of the crew. There were certainly some wonderful photographs.

I was wondering who was the unidentified NASA employee greeting you as you came back. Is that the usual person?

Captain TRULY. Yes, sir, that's the usual unidentified NASA official.

Mr. FUQUA. Well, we won't mention his name.

Captain TRULY. No, sir.

Mr. FUQUA. Mr. Nelson, do you have any questions?

Mr. NELSON. Thank you, Mr. Chairman.

I just—I noticed in that photograph, Dick, when you were on launch, you had your hand actually on the stick. Are you actually controlling——

Captain TRULY. No. We have the main stick control the vehicle during our ascent. Actually, we—on all the flights, the automatic system has—has—has actually controlled it, and it would only be after a series of failures that—that the commander would actually fly it.

The—we do have a radio button on the controller, so—in addition, just keeping my hand close to the control. I was using it to talk to Houston.

Mr. NELSON. Thank you.

Mr. FUQUA. Mr. Volkmer?

Mr. VOLKMER. Yes, I'd like to get to the adaptation to zero gravity.

Who was the first to feel that they were fully adapted and ready to go?

Dr. THORNTON. Oh, the adaptation process is—takes place in many areas, the muscular, skeletal, cardiovascular, and such. And in this particular case, we were particularly interested in the neurological system, of which a portion of the adaptation you have undoubtedly heard about is motion sickness and such which occurs in very few people.

Now, the first sensations typically are—I think most individuals will immediately sense the lightness, they see objects floating, and such as this. The sensation comes, in essence, from the seat of the pants, as it were, and also from the senses inside the head.

This is fairly frequently followed by a feeling of a rush of blood to the head, of fullness. And then, from that point on, it recedes. But these are the two early symptons.

Mr. VOLKMER. How long would you say it took you all to adapt to be able to proceed with normal——

Dr. THORNTON. This is a very individual thing. We were, before the second OMS burn was over, Dale and I were actually up, working, performing tasks which we had planned to do and had trained for. So, really, while we were still on the way into orbit, we were able to be up working quite effectively.

Mr. VOLKMER. The reason I asked that, when we had the STS–7 crew up, I believe there was a statement at that time that they thought within 2 to 3 hours you could be performing functions and putting satellites in orbit, that type of activity already.

Colonel BLUFORD. Well——

Dr. THORNTON. We—I'm sorry.

Two things. One is, as far as an individual adaptation, I think we—I think it would be fair to say that we've seen wide ranges. Some people essentially, even though they are adapting, they're totally unaffected by any feelings of malaise or whatever. Some are harder hit, and we're trying to understand that.

However, we concur with the STS–7 crew that, within a few hours of launch, that we could be prepared to safely and precisely do a deployment. And, I think, Guy and Dale, after doing the deployment of the Indian satellite, feel like that, if we had to do multiple deployments, we probably could deploy one on the revolution following the previous one, which is, say, 90 minutes——

Mr. VOLKMER. Ninety minutes.

Dr. THORNTON [continuing]. In between.

Mr. VOLKMER. Guy?

Colonel BLUFORD. Yeah. I was going to point out that, on our particular mission, we started up the electrophoresis experiment 3 hours after liftoff, and we really had no problems at all doing that on time. We ended up reconfiguring the cockpit for on orbit and had plenty of time to initiate that at 3 hours after liftoff.

Commander BRANDENSTEIN. And some of the adaptation that the 7 crew was referring to was purely mechanical. You know, it's the first time for some of us, first time in your life, you're in zero gravity, and if you'll push like on a computer button, you have to hold on with the other hand, because, you know, you go sailing across otherwise. And it's that type of mechanics that—just getting used to working in zero gravity.

Mr. VOLKMER. All right. Not something physically wrong, it's just the physical aspects of doing something.

Commander BRANDENSTEIN. That's correct, yes.

Mr. VOLKMER. Thank you, Mr. Chairman.

Mr. FUQUA. Thank you, Mr. Volkmer.

Mr. McCandless?

Mr. MCCANDLESS. Thank you, Mr. Chairman.

I'm curious, flying back across the States from California, did you fellows get any American Airline vantage miles? [Laughter.]

Commander BRANDENSTEIN. No, sir.

Mr. MCCANDLESS. They're usually listed on your boarding pass.

Commander BRANDENSTEIN. I don't believe so.

Mr. MCCANDLESS. I——

Captain TRULY. No, sir. I was just going to say that on STS–2, I put in my travel claim, my Government travel claim, and collected, I think, $20.28 or something, and I haven't filed it yet for STS–8.

Mr. MCCANDLESS. I see. Twenty-eight cents was pretty important, I guess, huh?

Captain TRULY. Yes, sir.

Mr. MCCANDLESS. Yeah.

Thank you, Mr. Chairman.

Mr. FUQUA. Thank you, Mr. McCandless.

Mr. Walker?

Mr. WALKER. Thank you, Mr. Chairman.

I have no particular questions, except, as a Pennsylvanian, I'd like to particularly say well done to Colonel Bluford and the whole crew, and just say to him that, with the problems that Penn State's having in football this year, the catching ability you were showing on the screen might be something Joe Paterno could use.

[Laughter.]

Mr. FUQUA. Thank you.

Mr. Reid?

Mr. REID. No questions.

Mr. FUQUA. We want to thank all of you for—again, for a very successful flight. I'm glad your flight was a little longer this time than last, Richard.

Mr. VOLKMER. Mr. Chairman?

Mr. FUQUA. Yes.

Mr. VOLKMER. As long as I still have a little time, I would like to get back to where I was going, and looking a little bit to the future.

Do you see any problems in the future, as far as expended-extended time in space for man, say, 3 months?

Dr. THORNTON. No. Based on extensive studies from Skylab, from the Russian experience, and from even—the even more intensive studies here, I see no difficulties for virtually—virtually unlimited months, even into conceivably years, so long as proper precautions are taken in flight to prepare for return to one G. What happens, very briefly, is that the human body, in a beautiful fashion, quickly adapts to this new environment, which it functions very well in.

Now, this adaptation may render it unfit for return to one G. However, we do know enough now such things—simple things—as you saw the treadmill—in other words, making the body believe that it's still back on Earth in some ways—will maintain the body, I contend—and I think this is generally shared in now—quite fit and able to come back to Earth with a very minimum of difficulties and, yet, be perfectly functional on orbit.

Mr. VOLKMER. In other words, no long-term adaptation necessary here on Earth once you return if you've been in space a long period of time?

Dr. THORNTON. No. You can—of course, you're not going out and play football the first day or two after months in orbit. But, no, you're quite capable of all of the necessary functions. On the short flights, it's over literally in a matter of hours.

Mr. VOLKMER. Thank you very much, Mr. Chairman.

Mr. FUQUA. Mr. Lewis, do you have any questions?

Mr. LEWIS. No, sir.

Mr. FUQUA. Again, let me thank you very much for a job well done. We're proud of you, your country's proud of you, and we look forward to continued success as we move into other flights. And those that have been assigned, or those awaiting assignment, good luck.

We appreciate you being here this morning.

The meeting is adjourned.

[Whereupon, at 11:25 a.m., the committee was adjourned.]

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